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ABSTRACT

In 1991 the New Zealand Fire Service planned a primary school fire-safety education program for children from new entrants to form 2. The program introduces a new module to the children each year of their primary education. This study was undertaken in an attempt to measure the effectiveness of the program. A sample of 1,089 children completed questionnaires and a smaller sample of 100 pupils demonstrated their knowledge of fire-safety procedures, including stop, drop, and roll; crawl low in smoke; and phoning 111 (the emergency number). The 1995 results were compared with those gathered in 1992, prior to the introduction of the Fire Service's programs. It was assumed that any improvements in children's results could be attributed in large measure to the introduction of the programs, although it was also recognized that other factors could have intervened. The results of the 1992 questionnaire indicated that standard 2 children already had a high knowledge of fire-safety procedures prior to the introduction of the new fire-safety programs. Not much improvement was recorded in the 1995 data, though significantly more children indicated they would call the Fire Service first rather than a parent when they saw a fire, and significantly fewer children in 1995 knew the most appropriate procedure if they were in a room full of smoke. In the fire safety skills demonstrations, while more children showed a mastery of skills, results showed that children either knew exactly what to do or had no idea of the appropriate response. The findings of the study indicated that although standard 2 children in 1995 have a heightened awareness of fire-safety, there is still room for improvement and need for many more schools to participate in the program. The 1995 questionnaire is included in the appendix. (ND)

CHILDREN'S KNOWLEDGE OF FIRE SAFETY

STAGE 2

THE FINAL REPORT FOR THE NEW ZEALAND FIRE SERVICE

Karyn Dunn
Margery Renwick

New Zealand Council for Educational Research

CHILDREN'S KNOWLEDGE OF FIRE SAFETY STAGE 2

What standard 2 children know about fire safety and where they got that information from

THE FINAL REPORT FOR THE NEW ZEALAND FIRE SERVICE

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Margery Renwick

New Zealand Council
for Educational Research
Wellington
1995

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INTRODUCTION

In 1991 the New Zealand Fire Service planned a primary school fire-safety education programme for children from new entrants to form 2. The programme introduces a new module to the children each year of their primary education.

The first module, *Calling the Fire Service, Stop, Drop, and Roll, and Crawling Low in Smoke*, is for new entrants and was produced in 1992. In this module the firefighters teach and demonstrate 3 topics: stop, drop, and roll (to extinguish flames if clothes are on fire); crawl low in smoke (to escape from smoke and fumes); and phoning 111 (to tell the Fire Service where the fire is). The second module, *Staying Safe from Fire*, is for J2 children and was introduced in 1993. In this module, the skills from the first module are reviewed and then new topics are introduced; keeping safe from matches, lighters, heaters, open fires, and stoves. The third module, the *Big Story Book*, was introduced in 1994.

The New Zealand Fire Service wanted to measure the effectiveness of its new fire-safety programmes for junior school pupils. It was decided to do this by first establishing standard 2 children's knowledge of fire-safety prior to the new programmes being introduced, and then at a later date comparing data with knowledge held by children who had experienced the new programmes.

The New Zealand Council for Educational Research (NZCER) was contracted in 1992 to assess standard 2 children's knowledge of fire safety, and the source of this knowledge. The children's level of knowledge from the 1992 survey formed the baseline data.

In 1995 NZCER was contracted to re-evaluate standard 2 children's knowledge of fire safety and to compare the findings with the 1992 survey. It was expected that by 1995 the standard 2 children surveyed would have had up to 4 annual visits from a Fire Service representative who taught the modules. This is the second and final report provided for the New Zealand Fire Service.

RESEARCH METHODOLOGY

Data Collection

Data were collected through:

1. A questionnaire administered to a sample of 1089 standard 2 children.

2. A demonstration by a smaller sample of 100 standard 2 children who showed how accurately they could perform the required fire-safety techniques.

The Sample

All schools that participated in the baseline study in 1992 took part in the re-evaluation of children's knowledge of fire safety in 1995. For a detailed description of the selection of the schools see the first report, *Children's Knowledge of Fire Safety* (Constable & Renwick, 1993). The 47 schools surveyed in this study were from the following regions: Hawke's Bay (Napier, Hastings, Flaxmere, Havelock North), Wairarapa (Masterton, Carterton, South Wairarapa), Wellington (Wellington Central, Upper Hutt, Lower Hutt, Porirua), and Marlborough (Tasman, Nelson, Blenheim). Table 1 shows a regional breakdown of the schools surveyed, the percent of children who completed the questionnaire, and the percent of children who demonstrated their skills in fire-safety.

Table 1

Regional Breakdown of Schools and Children Surveyed

Region	Schools N=47 %	Questionnaires N=1089 %	Demonstrations N=100 %
Hawke's Bay	21.0	24.0	22.0
Wairarapa	21.0	9.0	12.0
Wellington	45.0	45.5	46.0
Marlborough	13.0	21.5	20.0
Total	100.0	100.0	100.0

The number of children who completed questionnaires and took part in the demonstrations varied between 1992 and 1995. The target number for questionnaire completion was 1000 in both years. It was impossible to control this number exactly because of variation in class size and

we did not want to disrupt school programmes more than was necessary by controlling exactly the number of children at any school who participated. The result was that rather more than 1000 children participated in each year (1014 in 1992 and 1089 in 1995).

A conscious effort was made to increase the number of children taking part in the demonstrations from 62 in 1992 to 100 in 1995. This was because it was recognised that having children demonstrate their knowledge of fire-safety was a more reliable measure of their actual knowledge than completing a pencil-and-paper questionnaire, particularly for young children.

The type of statistical analysis used in this report, Chi Square, takes into account different sample sizes.

Children's Questionnaire

The questionnaire used in this study was exactly the same as that used in the 1992 study, except for a few format changes (*see* Appendix A). The 3 areas of fire-safety knowledge targeted by the study were:

- stop, drop, and roll,
- crawl low in smoke, and
- phoning 111.

The questionnaire comprised 10 structured questions (following 3 practice questions), where the children were asked to select the answer they thought correct from a list of options. For each question that tested their knowledge of fire-safety procedures, there was an accompanying question asking from whom they learnt this information. Three open-ended questions concluded the questionnaire.

The schools were asked to select a class of approximately 30 standard 2 children. If there were fewer than 30 standard 2 children in the school, all standard 2 children were asked to participate. The questionnaire was administered to the children by a NZCER researcher. The researcher read aloud each question and all the available options of answers in an attempt to overcome any reading or language difficulties experienced by the children. The teachers of the class were asked to be present to supervise the management and control of the children while the questionnaire was being administered. They also assisted with any reading or language problems, but did not otherwise help any child to answer any of the questions.

Children's Demonstration

The children's demonstration schedule was designed to observe how effective children were in demonstrating and carrying out fire-safety procedures. The demonstrations were conducted by the researcher, one child at a time. To ensure a random selection of children, the children whose last name began with the letter F were chosen. The children were asked to show the researcher what they would do in 3 different situations: if their clothes were on fire; if the room was full of smoke; and if they had to phone for help. The children's responses were observed and recorded

(*see* Appendix B). The children who participated in the demonstrations had not previously completed questionnaires.

Data Analysis

All data (for both questionnaires and demonstrations) were entered into a SAS data set from which frequencies and percentages were calculated. Frequencies from the 1992 study were compared with the current data to ascertain any changes in the children's knowledge. Chi Square ($\chi 2$) analyses were completed to test for statistically significant differences. Where significant differences between children's responses in 1992 and 1995 were found, the Chi Square value is reported. Where no value is reported, this indicates that the difference in responses between years is likely to be due to chance effects only.

RESULTS

Programmes Taught in Schools

The school principals were asked to indicate which of the new junior-school fire-safety programmes their school had participated in and in which years. Of the 47 principals surveyed, 44 responded. Only 4 principals indicated that their school had not participated in any of the new junior-school programmes and these schools were all in the Marlborough region. One principal was unsure if her/his school had participated in any of the programmes.

Of the 89 percent who said that their school had participated in at least 1 of the 3 programmes, not all had done so in each year. Table 2 shows the percentage of schools, by year, which had participated in each of the 3 junior-school programmes.

Table 2

Participation of Schools in New Fire-safety Programmes

Programmes	1992 %	1993 %	1994 %
Stop, drop, and roll	52	70	57
Staying safe from fire	-	41	48
Big story book	-	-	20

The schools were also given the opportunity to comment on the new junior-school fire-safety programmes. Following is a summary of the types of comments made:

- excellent programme,
- excellent 'hands on' experience and practical learning,
- children remembered information and responded positively,
- needs to be continued on a yearly basis to capture target audience,
- the Fire Service has offered intermittent support,
- the *Big Story Book* has too many words on a page for using in front of a class, and
- unaware of the availability of these resources.

Children's Questionnaire

Gender

Of the children who completed the questionnaire, 50 percent (N=548) were girls and 50 percent (N=540) were boys. One child did not specify her/his gender.

Responses to Structured Questions

My Clothes Are on Fire

The children were asked "*What is the first thing you should do if your clothes catch on fire?*". They were to choose the correct answer from 6 options by placing a tick in the box next to their choice. Table 3 summarises the results from the 1995 study and compares them with the 1992 results.

Table 3

My Clothes Are on Fire

Responses	1992 N=1014 %	1995 N=1089 %
Stop, drop on the floor, and roll	90.5	92.0
Run to the door	4.0	3.0
I don't know	2.5	2.0
Stand still and scream	1.0	1.0
Hide in a cupboard	1.0	1.0
Other, including no response	1.0	1.0
Total	100.0	100.0

As can be seen in table 2, 92 percent of the children responded with the correct answer, *"stop, drop on the floor, and roll"*. This compares with 90.5 percent in 1992. The percent of children who answered correctly was high in both years, and the difference in percentages between 1992 and 1995 is not statistically significant. As in 1992, the most likely response of children who did not give the correct answer was, "*run to the door*". Also, as in 1992, those children who answered with a response different from those options listed, gave answers involving water.

There was one small, but statistically significant, regional difference. Significantly more children in Hawke's Bay answered this question correctly than children in Wellington (96% v 90%; $\chi 2 = 7.14$, $p<0.05$ [df=1]).

An analysis was also done by removing the 4 schools which had not completed any of the new fire-safety programmes and comparing the children's answers with those children from schools which had done the new programmes. No significant differences were found in the number of correct responses between schools which had completed one of the programmes at least once, and those schools which had not completed any of the new junior-school programmes. There were also no gender differences in 1995 for this question.

I Am in a Smoky Room

The children were asked "*If the room is full of smoke what should you do first?*". The results for both 1992 and 1995 are shown in table 4.

Table 4
I Am in a Smoky Room

Responses	1992 N=1014 %	1995 N=1089 %
Crawl on the floor toward a window or door	69.5	63.5*
Stop, drop on the floor, and roll	12.0	19.5**
Run outside	10.5	8.5
Close your eyes and block your nose	3.0	4.0
I don't know	1.5	2.0
Hide in the corner until the smoke goes away	1.0	1.5
Other, including no response	2.5	1.0***
Total	100.0	100.0

*$\chi 2 = 7.88$ **$\chi 2 = 22.94$ *** $\chi 2 = 4.27$; $p<0.05$ (df = 1).

Table 4 shows that although 63.5 percent of the children answered this question correctly, there has been a significant decrease in the number of correct responses from 1992 to 1995. An interesting point to note is that although fewer children answered correctly, significantly more children responded, "*stop, drop, and roll*" in 1995 (19.5 percent) than in 1992 (12 percent). The number of "*other*" responses significantly decreased between the years, and there was little variation in the responses to the other options.

There were regional differences for the responses to this question. Significantly more children answered this question correctly in Hawke's Bay and Marlborough than in Wellington and Wairarapa (68%, 71% v. 59%, 57%; $\chi 2 = 5.65, 5.96, 9.44, 3.68$, $p<0.05$ [df=1]).

There were no significant differences in children's answers between those schools who had participated in the new junior-school programmes and those who had not, or by gender.

I Saw a Fire

The next question children were asked was "*If you were by yourself and you saw a fire, which of these things would you do first?*". Table 5 summarises the results for both 1992 and 1995.

Table 5
I Saw a Fire

Responses	1992 N=1014 %	1995 N=1089 %
Make a phone call	70.5	73.0
Call out; stop, drop, roll	10.0	9.0
Get some water	8.5	8.0
Ask if there is anybody inside	4.5	6.0
I don't know	3.0	2.0
Find a ladder	1.5	1.0
Other, including no response	2.0	1.0
Total	100.0	100.0

Table 5 shows that the number of correct responses to this question remained high at 73 percent. The pattern of responses in 1995 was similar to that of 1992 with no significant differences between years. Once again, the response, "*stop, drop, and roll*" had the highest frequency of the incorrect responses. Screaming or running for help was the most frequent response for "*other*".

No differences were found when the data were broken down by those children who had participated in the programmes and those who had not, by gender, or by region.

I Phone for Help

The children were asked "*If you have to phone for help about a fire, who would you call first?*". The children's responses for 1992 and 1995 are summarised in table 6.

Table 6
I Phone for Help

Responses	1992 N=1014 %	1995 N=1089 %
Fire Service	80.5	84.0*
Mum or Dad	8.5	6.0**
Police	5.0	3.5
Ambulance	4.0	5.0
I don't know	1.0	0.5
Other, including no response	1.0	1.0
Total	100.0	100.0

*$\chi 2 = 5.3$ **$\chi 2 = 3.86$; $p<0.05$ ($df = 1$).

Table 6 shows that the number of children who responded that they would call the Fire Service first if they saw a fire increased from 80.5 percent in 1992 to 84 percent in 1995. This difference was statistically significant. There has also been a significant decrease in the number of children who incorrectly answered that they would call a parent first. Although there was also a slight decrease in the children who would call the police, this did not reach statistical significance.

No differences were found when the data were broken down by those children who had participated in the programmes and those who had not, by gender, or by region.

The Phone Number I Would Call

The children were asked "*What phone number would you use to call the Fire Service?*". The results of the 1992 and 1995 studies are summarised in table 7.

Table 7
The Phone Number I Would Call

Responses	1992 N=1014 %	1995 N=1089 %
111	92.5	92.0
911	4.0	4.0
999	1.0	2.0
I don't know	2.0	1.5
Other, including no response	0.5	0.5
Total	100.0	100.0

As the number of correct responses were very high in the 1992 survey, few differences were expected, and table 7 shows that few were found (92.5 percent v. 92 percent). The pattern of other responses also remained similar between the years.

When the children from the schools which had not participated in any of the programmes were compared with those who had, a significant difference was found. More children who participated in the new programmes correctly recalled the response "*111*" than those children who had not (92% v. 86%, $\chi 2 = 2.85$, $p<0.05$ [df=1]).

One small but significant difference was found between regions. Children in Wairarapa were more likely to respond with the correct answer than children in Wellington (97% v. 91%, $\chi 2 = 3.67$, $p<0.05$ [df=1]). No differences were found in responses of girls and boys.

Where the Children Say They Learnt about Fire Safety

After each question assessing the children's knowledge of fire-safety, a question was asked regarding how they learnt their knowledge, for example, who told them what they should do in each emergency situation. For this question, the children were able to respond to more than one option, if more than one person told them what to do. Table 8 shows the combined responses for all 5 questions in 1995 as compared with the combined responses in 1992.

Table 8

How Do You Know What To Do First?
Total Responses for 5 Questions

Responses	1992 N=9864 %	1995 N=10612 %
Firefighter	20.5	28.5*
At home	22.5	18.5**
On television	18.0	16.0***
My teacher	15.0	17.0+
Just know	13.5	12.0++
Someone else	10.5	8.0+++
Total	100.0	100.0

*$\chi 2 = 169.05$ **$\chi 2 = 49.54$ ***$\chi 2 = 16.11$, $p<0.05$ (df = 1)
+$\chi 2 = 21.57$ ++$\chi 2 = 14.77$ +++$\chi 2 = 34.23$; $p<0.05$ (df = 1)

As table 8 shows, all responses differed significantly from 1992 to 1995. Significantly more children in 1995 reported having learnt their fire-safety knowledge from a firefighter or teacher, whereas significantly fewer children reported having learnt this information from home, television, someone else, or "just knowing". Of the children who reported having learnt the information from someone else, the most common response, as with the 1992 survey, was their mother.

There were also significant differences between girls and boys in the 1995 survey, as shown in table 9.

Table 9

Where Girls and Boys Learnt about Fire Safety
Total Responses for 5 Questions

Responses	Girls N=5287 %	Boys N=5316 %
Firefighter	27.5	30.0*
At home	19.5	17.5**
On television	14.5	17.0***
My teacher	18.5	16.0+
Just know	11.0	12.5++
Someone else	9.0	7.0+++
Total	100.0	100.0

*$\chi 2 = 5.98$ **$\chi 2 = 6.18$ ***$\chi 2 = 15.46$; $p<0.05$ (df = 1)
+$\chi 2 = 12.54$ ++$\chi 2 = 5.58$ +++$\chi 2 = 13.32$; $p<0.05$ (df=1)

As it can be seen in table 9, girls and boys responded differently to the questions about where they learnt their fire-safety knowledge. All the differences found in the 1992 study were confirmed in the 1995 study. Significantly more boys reported they learnt from a firefighter, television, or "just knew", whereas significantly more girls responded they learnt from home, their teacher, or someone else.

In 1995 there were several regional variations in where children reported they learnt their fire-safety knowledge.

- Significantly more children learnt from a firefighter in the Wairarapa (32.5%) and Hawke's Bay (32%) than those children in Wellington (27%) and Marlborough (25.5%), ($\chi 2$ = 20.46, 2.72, $p<0.05$ [df=1]).
- Significantly more children learnt from their teacher in Marlborough (20%) than in Wellington (17%), and significantly fewer children learnt from their teacher in Hawke's Bay (15%) than those children in Wellington and Wairarapa (19%), ($\chi 2 = 7.76, 4.07$, $p<0.05$ [df=1]).
- Significantly more children learnt at home in Wellington (19%) and Marlborough (20.5%) than those children in Wairarapa (16%) and Hawke's Bay (17%), ($\chi 2 = 3.7$, $p<0.05$ [df=1]).
- Significantly more children learnt from television in Wellington (16%) and Hawke's Bay (17%) than those children in Marlborough (14%), ($\chi 2 = 5.68$, $p<0.05$ [df=1]).

When the 1992 responses were compared with the 1995 responses by region, the only region which showed the same trends in both surveys was Marlborough.

Responses to Open-ended Questions

The children's questionnaire ended with 3 open-ended questions. The first open-ended question was, "*What things can start a fire in your house?*". The children's responses are summarised below:

	Percent
• Matches	65
• Oven, microwave, stove	39
• Cigarettes, lighters	37
• Fireplace, candles, ash	29
• Electrical appliances, electricity	21
• Heaters	20
• Outside fire, fireworks, BBQ	4
• Other (e.g., gas, petrol, arsonist, burglar, rubbish, paper, wood, gun, bomb, weather, earthquake, car crash, stones, sticks)	25

The second open-ended question was, "*What is a smoke alarm for?*". The children's responses are summarised below:

	Percent
• Warns you that there is a fire	41
• When there is smoke/fire, without reference to warning	36
• Signals when there is a fire/smoke	17
• Wakes people up	5
• Detects smoke/fire	4
• Puts out fires	1
• Other (e.g., for Fire Service/police to hear, safety, for fire drill, you ring it when there is a fire, stops the smoke, when you have to stop, drop, and roll, when you're outside)	7

The final question in the questionnaire was, "*What should you do if you find a box of matches?*". The children's responses are summarised below:

	Percent
• Give them to a parent	41
• Leave them alone	23
• Put them somewhere safe	18
• Give them to an adult	12
• Throw them in the rubbish	10
• Give them to teacher/police/Fire Service	2
• Other (e.g., put them in my pocket, keep them, use them, light a fire with them)	2

The frequency of responses in the 1995 survey to these 3 open-ended questions was similar to that of 1992, with most differences between the years being less than a 10 percent change. The exceptions to this were: a decrease in the number of children who stated a fireplace (12 percent) or a heater (10 percent) as being able to start a fire; a 13 percent decrease in the number of children who stated that a smoke alarm detects fire/smoke; and an increase of 10 percent in the number of children who stated a smoke alarm was for when there was fire/smoke, without reference to it being a warning device.

Children's Demonstration of Fire-safety Procedures

The purpose of the children's demonstration was to validate knowledge that the children said they had in the children's questionnaire. As mentioned earlier (*see* page 4), the number of demonstrations was increased from 62 in 1992 to 100 in 1995 in order to increase the validity and reliability of this section of the study, and give it greater statistical power.

Gender

Of the 100 children who participated in the demonstrations, 51 were girls and 49 were boys.

Demonstration Responses

What Would You Do if Your Clothes Were on Fire?

The children were asked to demonstrate to the researcher what they would do if their clothes caught on fire. Again in 1995, the following criteria were used to rate the level of mastery obtained by the children.

- Mastery: The child stopped, dropped to the floor, and continued rolling until the flames were out.
- Partial mastery: The child dropped to the floor but did not continue rolling until the flames were out, *or* a child whose first reaction was to run away but subsequently remembered to stop, drop, and roll, *or* a child who rolled with shoulders above ground level and/or knees bent .
- Non-mastery: No correct responses were made.

The children's degree of mastery for 1992 and 1995 is summarised in table 10.

Table 10

Children's Mastery of Stop, Drop, and Roll

Degree of Mastery	1992 N=62 %	1995 N=100 %
Mastery	47.0	71.0*
Partial mastery	14.5	2.0**
Non-mastery	38.5	27.0
Total	100.0	100.0

*$\chi 2 = 8.51$ **$\chi 2 = 7.6$; $p<0.05$ (df = 1)

As shown in table 10, a significantly greater number of children in 1995 reached mastery level than in 1992 when asked to demonstrate what they would do if their clothes caught on fire. The percent of children reaching mastery level increased from nearly half in 1992 to nearly three-quarters in 1995. There was also a significant decrease in the number of children who reached only partial mastery level in 1995. Although there was a slight decrease in 1995 in the number of children who were at the non-mastery level, this difference was non-significant.

Of the 71 children who reached mastery level, only 20 covered their face and 26 children needed to be prompted to keep rolling as "*the flames aren't out yet*". Of the 27 children who recorded non-mastery, 13 did not know what to do and 14 performed an alternative response. The most common alternative response was for the child to get some water, followed by taking their clothes off, or patting the flames out with their hand.

There were significant differences found in the level of mastery reached by girls and boys. More boys reached mastery level than girls (82% v. 61%, $\chi 2 = 4.31$, $p<0.05$ [df=1]), and more girls were at the non-mastery level than boys (37% v. 16%, $\chi 2 = 4.54$, $p<0.05$ [df=1]).

No significant differences were found when the children from the 4 schools which had not completed any of the programmes were compared with the rest of the children, or by region.

What Would You Do if You Were in a Room Full of Smoke?

The children were asked to demonstrate what they would do if the room was filled with smoke. The children's levels of mastery were described as follows:

- Mastery: The child got down on her/his hands and knees and crawled quickly to an exit.
- Partial mastery: The child got down but dragged her/his body along the ground toward an exit.
- Non-mastery: No correct responses were made.

The children's degree of mastery in 1992 and 1995 is summarised in table 11.

Table 11

Children's Mastery of Crawl Low in Smoke

Degree of Mastery	1992 N=62 %	1995 N=100 %
Mastery	56.5	46.0
Partial mastery	11.5	14.0
Non-mastery	32.0	40.0
Total	100.0	100.0

As shown in table 11, although the number of children who mastered crawling low in smoke decreased from 56.5 percent in 1992 to 46 percent in 1995, this difference was not found to be statistically significant.

Of the 40 children who had not mastered this skill, 28 did not know what to do, 5 ran away, 4 performed stop, drop, and roll, 2 wanted to phone for help, and 1 child yelled for help. In the 1992 study, only 4 children were recorded as not knowing what to do.

A comparison of the data by gender found significant differences. Significantly more boys reached the partial mastery level than girls (22% v. 6%, $\chi 2 = 4.4$, $p<0.05$ [df=1]), and significantly more girls recorded non-mastery than boys (57% v. 22%, $\chi 2 = 10.94$, $p<0.05$ [df=1]).

No significant differences were found between the children from schools which had completed at least one of the new programmes and those who had not, or by region.

How Would You Telephone for Help if There Was a Fire at Your House?

The children were asked to demonstrate calling 111 for help about a fire. A telephone was used for the demonstration and the researcher acted as the telephone operator. The levels of mastery were described as follows:

- Mastery: The child correctly dialled 111, communicated that there was a fire or that s/he needed the Fire Service, and correctly gave her/his address.
- Partial mastery: The child correctly dialled 111, communicated that there was a fire, but failed to correctly communicate her/his address.
- Non-mastery: No correct responses were made.

The children's demonstrations for 1992 and 1995 are summarised in table 12.

Table 12

Children's Mastery of Telephoning for Help

Degree of Mastery	1992 N=62 %	1995 N=100 %
Mastery	84.0	95.0*
Partial mastery	2.0	2.0
Non-mastery	14.0	3.0**
Total	100.0	100.0

*$\chi 2 = 4.39$ **$\chi 2 = 5.82$; $p<0.05$ (df = 1)

As shown in table 12, there was a significant increase in the number of children who reached mastery level in 1995 compared with 1992, and a significant decrease in the children with no skills in calling 111 for help.

Of the 95 children who reached mastery level, 69 knew to ask for the Fire Service when asked which service they required, 72 gave the name of the suburb (often after prompting from the researcher), and 34 children could give a connecting street name. Of the 3 children who had no mastery of this skill, one child asked for an ambulance, one child dialled 911, and one child did not know what to do.

No significant differences were found when the data were broken down by those children who had participated in the new fire-safety programme, by gender, or by region.

DISCUSSION

This study was undertaken in an attempt to measure the effectiveness of the NZ Fire Service's fire-safety programmes for junior school pupils. In the study a sample of 1089 children completed questionnaires and a smaller sample of 100 pupils demonstrated their knowledge of fire-safety procedures. The 1995 results were compared with those gathered in 1992, prior to the introduction of the Fire Service's programmes. It was assumed that any improvements in children's results could be attributed in large measure to the introduction of the programmes, although it was also recognised that other factors could have intervened.

Children's Questionnaire

From the outset it was acknowledged that there would be problems in accurately ascertaining children's knowledge of fire-safety because of the age of the children concerned. In order to gather data from a large enough population of children, it was decided to use a questionnaire which could be administered to an entire class of standard 2 children at one time.

To avoid the questionnaire being a measure of literacy skills, the questions were read to the children. However, the children's ability to respond to the questionnaire still varied. For example, some children were comfortable about ticking boxes, but did not supply written responses when asked. Nor was it possible to determine whether children who ticked the right box really understood the questions and appropriate response or just randomly ticked boxes. Furthermore, the situation in which much of the testing occurred was not ideal. The children's usual classroom with their teacher present was the preferred setting, but this was not always the case and some groups of children were tested elsewhere, for example, in a hall or library sitting on the floor. This meant that it was difficult to ensure that children answered the questions by themselves without talking to their neighbour or looking at their responses. Children sitting next to each other frequently had identical responses to the questions, both correct and incorrect. It must also be remembered that the children were responding to forced choice questions in which they were presented with the correct answer as one of the possible responses. For these reasons care must be taken in placing too much weight on the findings from the questionnaire because while it is true that, from the children's responses, it appears that standard 2 children have a high knowledge of fire-safety, the demonstrations showed that a lower percent of children were able to respond automatically in the appropriate way. In a real emergency, with the likelihood of associated fear and panic, the percent of children who respond correctly could well be lower.

The results of the 1992 questionnaire indicated that standard 2 children already had a high knowledge of fire-safety procedures prior to the introduction of the new fire-safety programmes. As the frequency of correct responses in 1992 was high, ranging from 69.5 percent to 92.5 percent, it was not expected that much improvement would be recorded through this pencil-and-paper test. This proved to be the case, with very few differences being found between the baseline data collected in 1992 and that collected in 1995.

The only response to the questionnaire that significantly improved between the surveys was

the children's answers as to who they would call first if they saw a fire. Significantly more children in 1995 said they would call the Fire Service first than had been the case in 1992, and significantly fewer said they would call a parent first. It is reasonable to assume that the children's increased awareness of the importance of contacting the Fire Service immediately can be attributed to the fire-safety programme, particularly as when children were later asked who taught them what to do first in an emergency situation involving fire, the most common response in 1995 was a firefighter.

Since 1992 there has been a significant increase in the number of children who reported that they learnt their fire-safety knowledge from a firefighter, followed by their teacher, and a significant decrease in learning from other people. This suggests that children are learning fire-safety information from the Fire Service in a school setting. This is particularly the case with boys.

As the 4 schools in 1995 that had not participated in any of the new fire-safety programmes were all from Marlborough, it was thought that regional differences might distinguish the children from Marlborough as having less fire-safety knowledge. This was not the case. Marlborough did not rate significantly lower for any of the knowledge questions in the 1995 survey. However, it is interesting to note that children from Marlborough, when compared with those from other regions, were less likely to say that they had learnt their fire-safety knowledge from a firefighter.

One disappointing finding from the questionnaire was that the responses of the children in 1995 indicated that significantly fewer standard 2 children than in 1992 knew the most appropriate procedure if they were in a room full of smoke. This was also the question the greatest number of children had difficulty answering correctly in 1992. Not only was this still the case in 1995, but a significantly larger percent of children made an incorrect response. It is important to note that one of the reasons for the increase in the number of children who made an incorrect response was because of the greater number of responses to, "*stop, drop, and roll*" "*Stop, drop, and roll*" is a catchy phrase which has been widely promoted to describe what children should do when their clothes are on fire. It has been well publicised through the use of posters in schools. It maybe that children have become confused about the occasions on which this action is appropriate and now believe that this is what they should do if they are in a smoky room as well as when their clothes are on fire.

Children's Demonstrations

We believe that the children's demonstrations are a more valid measure of children's competence in reacting appropriately in an emergency fire situation, than are their responses to a pencil-and-paper questionnaire. Unfortunately, this is an expensive and time-consuming way of gathering data. However, the number of children asked to demonstrate their knowledge of fire-safety was increased from 62 in 1992 to 100 in 1995. It is reassuring to note that in 2 of the 3 demonstrations there had been a significant increase in the skills displayed by children. For these 2, the number of correct skills displayed by the children was high: "*stop, drop and roll*", 71 percent, and correctly telephoning for help, 95 percent.

Several differences were also found between the data collected in 1992 compared with the

data collected in 1995. Significantly more children achieved mastery level in their demonstration of " *stop, drop, and roll*" in 1995 than in 1992 and significantly fewer children were at the partial-mastery level. The number of children who had no mastery of this skill had not changed significantly. This suggests that the number of children who previously had partial mastery of this skill now have total mastery, but the same proportion of children as in 1992 have not yet mastered this skill. In other words, children either know exactly what to do, or have no idea of the appropriate response. When the researchers talked with the children after the demonstration they found that the children had heard of "*stop, drop, and roll*" and when prompted remembered when they should use it, but it was not an automatic response. As 92 percent of the children in the questionnaire responded with the correct answer, the findings of the demonstrations suggest that although most children recognise "*stop, drop, and roll*" as a technique, in an emergency situation the number of children who would actually apply the technique is fewer.

There was a 10 percent decline in the number of correct demonstrations of the skill, " *crawl low in smoke*", and an 8 percent increase in the number of non-mastery demonstrations, but these differences were not significant. It is important to note, however, that whereas in 1992 only 6.5 percent of the children did not know what to do when faced with a room full of smoke, in 1995, 28 percent of the children did not know what to do. This is a large increase in the percentage of children who did not make a move to do something, even if it was an inappropriate action. Many children, when talking to them afterwards, were not familiar with "*crawl low in smoke*", and the researcher often had to take the child , step by step, through the correct procedure. This low number of correct demonstrations of this skill strengthens the findings from the questionnaire that children's knowledge of crawling low in smoke is the least developed of all fire-safety skills assessed by this study. The danger of being burnt from fire is well known by children and most, if not all, will have experienced the heat from an open flame. However, we do not believe that many children are aware of the immense dangers of smoke. The importance of knowing "*crawl low in smoke*" is not seen by children as being as essential as that of "*stop, drop, and roll*". Children need to be aware that smoke can, and does, cause death in a fire.

The final skill assessed in the demonstrations was dialling 111 for help. The number who demonstrated mastery in the 1992 survey was very high at 84 percent, but significantly more children demonstrated mastery in the 1995 survey (95 percent). This indicates that the skill of obtaining help by dialling 111 has been mastered by almost all children at the standard 2 level in 1995.

The findings of this study would indicate that although standard 2 children in 1995 have a heightened awareness of fire-safety, there is still room for improvement. An important issue for the Fire Service to address is the number of schools which did not participate in each year of the programme. Very few schools have participated in each year of the implementation of the new fire-safety programmes for junior school pupils since their introduction in 1992.

BIBLIOGRAPHY

Constable, C. & Renwick, M. (1993). *Children's knowledge of fire safety: A report for the New Zealand Fire Service.* Wellington: New Zealand Council for Educational Research.

New Zealand Fire Service. (1992). *Calling the Fire Service; Stop, drop, and roll; Crawl low in smoke.* Wellington: New Zealand Fire Service.

New Zealand Fire Service. (1993). *Staying safe from fire.* Wellington: New Zealand Fire Service.

New Zealand Fire Service. (1994). *The big story book.* Wellington: New Zealand Fire Service.

APPENDIX A: Children's Questionnaire

We would like to find out what you know about safety and fire. Please answer each question by ticking the box you think is correct. Try these practice questions first.

Each time tick the best answer like this ☐

PRACTICE QUESTIONS

A. Are you a girl or a boy?
(tick one box)

☐ (a) Girl

☐ (b) Boy

B. How often do you think most children watch TV?
(tick one box)

☐ (a) every day

☐ (b) only in the weekend

☐ (c) never

☐ (d) I don't know

Write anything else you think is a better answer here

_____

C. What flavours of icecream do you like?
(you can tick more than one box this time)

☐ (a) banana

☐ (b) hokey pokey

☐ (c) chocolate

☐ (d) orange

Write other flavours you like here _____

_____

MY CLOTHES ARE ON FIRE

1. What is the **first** thing you should do if your clothes catch on fire? (tick one box)

☐ (a) Run to the door

☐ (b) Stop, drop on the floor and roll

☐ (c) Hide in a cupboard

☐ (d) Stand still and scream

☐ (e) I don't know

Write anything else you might do **first** if your clothes catch on fire

_____

2. How do you know what is the **first** thing to do if your clothes catch on fire?
(you can tick more than one this time)

☐ (a) My teacher told me

☐ (b) I learned it at home

☐ (c) I saw it on TV

☐ (d) A firefighter told me

☐ (e) I just know

☐ (f) Someone else told me

If someone else told you,
who was that person? _____

Write anything else here about **how you know** what to do **first** if your clothes catch on fire

_____

I AM IN A SMOKY ROOM

3. If the room is full of smoke what should you do **first**? (tick one box)

☐ (a) Run outside

☐ (b) Hide in the corner until the smoke goes away

☐ (c) Close your eyes and block your nose

☐ (d) Crawl on the floor towards a window or door

☐ (e) Stop, drop on the floor and roll

☐ (f) I don't know

Write anything else you should do **first** if the room is full of smoke

_____

4. How do you know what to do **first** if the room is full of smoke?
(you can tick more than one this time)

☐ (a) My teacher told me

☐ (b) I learned it at home

☐ (c) I saw it on TV

☐ (d) A firefighter told me

☐ (e) I just know

☐ (f) Someone else told me

If someone else told you,
who was that person? _____

Write anything else here about **how you know** what to do **first** if the room is full of smoke

_____ _____

5. If you were by yourself and you saw a fire, which of these things would you do **first**? (tick one box)

☐ (a) Find a ladder

☐ (b) Make a phone call

☐ (c) Get some water

☐ (d) Ask if there is anybody inside

☐ (e) Call out stop, drop and roll

☐ (f) I don't know

Write anything else that you would do **first** if you were on your own and you saw a fire

_____

6. How did you know what you should do **first** if you were on your own and you saw a fire? (you can tick more than one this time)

☐ (a) My teacher told me

☐ (b) I learned it at home

☐ (c) I saw it on TV

☐ (d) A firefighter told me

☐ (e) I just know

☐ (f) Someone else told me

If someone else told you,

who was that person? _____

Write anything else here about **how you know** what to do **first** to help when you see a fire

_____

I PHONE FOR HELP

7. If you have to phone for help about a fire who would you call **first**? (tick one box)

☐ (a) Ambulance

☐ (b) Mum or Dad

☐ (c) Fire Service

☐ (d) Police

☐ (e) I don't know

Write here if there is someone else you would call **first** for help about a fire

_____

8. How do you know who to call **first** for help when there is a fire?
(you can tick more than one this time)

☐ (a) My teacher told me

☐ (b) I learned it at home

☐ (c) I saw it on TV

☐ (d) A firefighter told me

☐ (e) I just know

☐ (f) Someone else told me

If someone else told you,
who was that person? _____

Write anything else here about **how you know** who to phone **first** for help about a fire

_____

THE PHONE NUMBER I CALL

9. What phone number would you use to call the Fire Service? (tick one box)

☐ (a) 111

☐ (b) 911

☐ (c) 999

☐ (d) I don't know

☐ (e) Write the number here if you think there is a better number to call the Fire Service _____

10. How do you know the number of the Fire Service?

(you can tick more than one this time)

☐ (a) My teacher told me

☐ (b) I learned it at home

☐ (c) I saw it on TV

☐ (d) A firefighter told me

☐ (e) I just know

☐ (f) Someone else told me

If someone else told you, who was that person? _____

Write anything else here about **how you know** what number to use to call the Fire Service

_____

SOME QUESTIONS ABOUT SAFETY AND FIRE

11. What things can start a fire in your house?

---

12. What is a smoke alarm for?

---

13. What should you do if you find a box of matches?

APPENDIX B: Children's Demonstration Checklist

Child's Gender

☐ Girl

☐ Boy

CLOTHES ARE ON FIRE

1A

☐ a) Didn't know

☐ b) Hesitated

☐ c) Ran away

☐ d) Stopped

☐ e) Covered face

☐ f) Dropped to the floor

☐ g) Rolled

☐ h) Interviewer said *"keep rolling - the flames aren't out yet"*

☐ i) Continued rolling backward and forward till the flames are out

☐ j) Child performed alternative response (e.g., wet their clothes to put the flames out)

1B

☐ a) **MASTERY**

☐ b) **PARTIAL MASTERY**

☐ c) **NON-MASTERY**

A SMOKY ROOM

2A

☐ a) Didn't know

☐ b) Hesitated

☐ c) Ran away

☐ d) Looked around for an exit window or door

☐ e) Got down on hands and knees

f) Crawled:

☐ [i] quickly

☐ [ii] on hands and knees

☐ [iii] on hands and forearms

☐ [iv] to the exit

g) Kept head low:

☐ [i] some of the time

☐ [ii] most/all of the time

☐ h) Child performed alternative response (e.g., wet a cloth to put over their mouth, covered face or called out "help")

2B

☐ a) **MASTERY**

☐ b) **PARTIAL MASTERY**

☐ c) **NON-MASTERY**

DIAL 111

3A

☐ a) Knows 111

☐ b) Dials 111

☐ c) Waits for Telecom to answer

d) Communicates to Telecom that:

☐ [i] there is a fire

☐ [ii] they want the Fire Service

☐ e) Waits for the Fire Service to answer

☐ f) Communicates to the Fire Service that there is a fire

☐ g) Gives street name

☐ h) Gives street number

☐ i) Gives connecting street

☐ j) Gives suburb

3B

☐ a) **MASTERY**

☐ b) **PARTIAL MASTERY**

☐ c) **NON-MASTERY**